Surface Permeability Audit

Introduction:

One way to examine surface characteristics is through infiltration rates, or how quickly water soaks into the ground. Infiltration rates are an indication of how permeable a surface is. The greater the infiltration rate the greater the permeability of the surface, the smaller the infiltration rate the lower the permeability. How well rain infiltrates depends on different factors including the material that makes up the surface, the slope of the land, texture of the soil, type of vegetation present, and how much water is already present in the soil. Permeability is an important property of soil and other surfaces. Rainwater that does not penetrate a surface will run off quickly, contributing to flooding and soil erosion and taking any pollutants on the surface with it, thereby affecting water quality. Rainwater that enters a surface, and ultimately the soil, will provide water to plants and will replenish ground water supplies.

Definitions:

Infiltration: water flow into the surface of soil
Soil texture: the combination of soil particles of different sizes
Permeability: the rate that water moves through the soil

Materials:

Students will work in pairs to conduct infiltration tests at the major surfaces on the school grounds. For each surface, one member of the pair will assume a role: timer/recorder and pourer/measurer. Each surface should be sampled by at least 3 teams to get more accurate data.

- Soup can with bottom and top removed
- Ruler
- Stopwatch
- Container of water
- Rubber mallet (optional)
- Data sheets #1 and #2
- Clipboard or other hard writing surface

Procedure:

1. Choose a level spot to conduct the infiltration test. If possible, twist the can into the surface, using the rubber mallet to sink the can about 4cm into the surface. If the surface is too solid to get the can into it, such as concrete or asphalt, then hold the can firmly against the surface. If possible, use duct tape or electrical tape to secure the can to the surface and create a seal.

2. Set stopwatch to 0:00. The pourer/measurer should insert ruler into the can so the "0" is resting on the soil surface. Pour water into the can up to the 5cm mark on the ruler. The timer/recorder should begin timing as the pourer pours water into the can.

3. The water level of the pre-measured amount of water is 5cm, which is already recorded on the data sheet. Record the depth of water in the soup can every minute for 10 minutes. If possible, leave the ruler in the can to ensure that measurements are taken in the same location each time. If all the water infiltrates completely before 10 minutes, indicate so on the data sheet.

4. If the water level does not decrease, or if water is simply seeping out from under the can instead of infiltrating into the surface, record a "0" on the data sheet indicating no change in depth due to infiltration. Lift up the can to release the water and make note of what direction the water is flowing.

5. Repeat this procedure for each major surface on the school grounds.

6. Once all the data has been collected return to classroom for analysis. Fill in the remaining columns with calculation from the collected data.

7. After each group has performed initial calculations, consolidate all the data. Use class data to calculate an average infiltration rate for each surface.

Surface Permeability Audit Data Sheet #1

Club member names: _____

Surface type: _____

Infiltration test

Time (in minutes)	Water Depth (mm) (1 cm = 10 mm)	Change in Depth (mm)	Infiltration Rate (mm change / min)
0	50		
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
		Average rate / min:	
		Average rate / hour: (mulitply rate/min by 60)	

Surface Permeability Audit Data Sheet #2

Group	Surface: _____ Average Infiltration Rate (mm/hr)	Surface: _____ Average Infiltration Rate (mm/hr)	Surface: _____ Average Infiltration Rate (mm/hr)	Surface: _____ Average Infiltration Rate (mm/hr)	Surface: _____ Average Infiltration Rate (mm/hr)	Surface: _____ Average Infiltration Rate (mm/hr)
A						
B						
C						

Average						

Which surfaces are the most permeable? Which are the least?